

## Order out of Chaos

### Elucidating the Opposing Effects of Air Pollutants and Heat on Blood Pressure

A body of research suggests that people with diabetes may be especially vulnerable to adverse cardiovascular effects of air pollution and heat, although the combined effects of these factors are not clear. Now an international team of researchers sheds light on potential impacts of this dual exposure [*EHP* 120(2):241–246; Hoffmann et al.]. In a study of the short-term effects of ambient air pollutants and temperature on arterial blood pressure in 70 people with type 2 diabetes mellitus, they found opposing effects—fine particulate matter (PM<sub>2.5</sub>) and black carbon in particular, were associated with increases in systolic blood pressure (SBP), whereas ozone and higher temperature were associated with decreases.

The study subjects, from the Boston, Massachusetts, area, ranged in age from 45 to 86 and were evaluated between September 2006 and August 2010. Each participant lived within 25 km of a central air pollution monitor. At each of 5 clinic visits spaced 2 weeks apart, participants answered questions and underwent blood and urinary analyses and clinical examinations. Mixed models that accounted for repeated measures in individual participants were used to estimate associations between air pollutants and temperature and blood pressure.

The researchers estimated that each interquartile increase in PM<sub>2.5</sub> or black carbon in the 5 days prior to a clinical examination was linked with an average increase in SBP of 1.4 mmHg and 2.2 mmHg, respectively. In contrast, an interquartile increase in ozone was associated with a 5.2-mmHg decrease in SBP. Each increase of 11.5°C in mean temperature was associated with a 3.2-mmHg decrease in SBP before adjusting for ozone exposure. Estimated increases in blood pressure with PM<sub>2.5</sub> exposure were greater in people with elevated baseline blood pressure, whereas associations with ozone exposure and temperature were greater in people with lower to normal blood pressure. Estimated differences in blood pressure tended to be progressively greater for each of up to 5 additional days of exposure prior to each clinical exam.

The researchers accounted for possible confounding factors such as sociodemographic variables, lifestyle indicators, prescription drug use, tobacco smoke, health history, and season. However, they were not able to estimate personal levels of exposure using the local and area monitoring stations, and factors such as physical activity were not addressed.

The authors note that the opposing effects may not cancel each other out and could plausibly act negatively in independent ways. Decreased SBP can be good in moderation, but it could be dangerous if lowered suddenly and significantly, especially in subjects with compromised vascular compensation mechanisms, which is common in diabetic patients.

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## Cadmium May Affect Newborn Girls More than Boys

### Maternal Exposure Linked to Smaller Birth Size

Chronic exposure to cadmium, which primarily occurs through diet and smoking, damages the kidneys, weakens bones, and may increase cancer risk. The metal is also an endocrine disrupter and may adversely affect reproduction and child development. Animal studies indicate cadmium induces multiple defects in developing embryos, but it is unknown whether similar effects occur in humans. However, a new study shows that maternal cadmium exposure is associated with reduced head circumference and birth weight in newborn girls [*EHP* 120(2):284–289; Kippler et al.].

The study used data collected from more than 1,600 pregnant women participating in the Maternal and Infant Nutrition Interventions, a food and micro-nutrient supplementation trial in Matlab, Bangladesh. The women provided urine samples and completed clinical examinations in early pregnancy. Information on demographics and tobacco and betel use during pregnancy also was collected, along with newborns' sex and physical measurements.

Average adult daily intakes of cadmium were estimated on the basis of rice consumption to be 25–35 µg, similar to those in other Asian countries where rice is a staple but higher than levels reported in U.S. and European women. Statistical analyses, controlled for confounding

by maternal, birth, and newborn factors, suggested that for each 1-µg/L increase in maternal urinary cadmium, head circumference decreased by 0.26 cm and weight dropped by 45 g on average among newborn girls. Far smaller associations were seen for boys.

Cadmium may affect fetal growth by several mechanisms, including impaired nutrient transport and endocrine disruption. Sex-based differences in specific hormone levels as well as in cadmium uptake and mechanisms of action—which have been reported in experimental studies—may have played a role in the current findings. The authors say the estimated average reductions in head circumference and weight are unlikely to be clinically significant for individual children but could have public health implications given widespread dietary cadmium exposure and adverse effects associated with reduced birth size.

The main strengths of the study are its prospective design, large number of participants, wide range of exposure, and consideration of numerous confounding factors. However, the potential for unmeasured or residual confounding remained, as in all observational studies, and infants' cadmium exposure was not directly assessed (for instance, by measuring cadmium levels in cord blood). Continuing research should follow the children to determine if growth effects are sustained through childhood and whether other health changes appear later in childhood.

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Asian diets high in rice consumption may lead to elevated cadmium intake, which has been linked to reduced birth size in girls.

